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ABSTRACT

Although heroin use has decreased in the general population during the last few years, a troubling new trend is emerging. Use is up among school-age children and they are now subject to a popular culture in music and films that glamorizes its use. This trend along with increased availability and purity of heroin has created a major health concern for mental health workers and educators. This publication aims to present the latest research findings about heroin abuse and addiction. It explains about the known health repercussions that extend beyond the user. The health and social consequences of drug abuse in family, educational, and work environments have a devastating impact on society and cost billions of dollars. On a hopeful note, treatment for opiate addiction is more available and is becoming more effective. This publication provides information and guidance for health workers and educators in their preventive efforts in drug education. (Contains 24 references.) (JDM)

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Heroin:

Abuse and Addition.

National Institute on Drug Abuse Research Report Series

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NATIONAL INSTITUTE ON DRUG ABUSE

Research Report SERIES

HEROIN Abuse and Addiction

from the director

Although heroin abuse has trended downward during the past couple of years, its prevalence is still higher than in the early 1990s.

These relatively high rates of abuse, together with the significant heroin abuse we are now seeing among school-age youth, the glamorization of heroin in music and films, changing patterns of drug use, and heroin's increased purity and decreased prices, make it imperative that the public have the latest scientific information on this topic.

The National Institute on Drug Abuse (NIDA) has developed this publication to provide an overview of the latest research findings on heroin abuse and addiction.

Heroin is a highly addictive drug, and its abuse has repercussions that extend far beyond the individual user. The health and social consequences of drug abuse–HIV/AIDS, violence, tuberculosis, fetal effects, crime, and disruptions in family, workplace, and educational environments–have a devastating impact on society and cost billions of dollars each year.

Fortunately, the availability of treatments to manage opiate addiction and the promise of new treatments from research provide hope for individuals who suffer from addiction and for those around them.

We hope this compilation of scientific information on heroin will help to inform readers about the harmful effects of heroin abuse and addiction and will assist in prevention and treatment efforts.

Alan I. Leshner, Ph.D.
Director
National Institute on Drug Abuse

What is heroin?

Heroin is an illegal, highly addictive drug. It is both the most abused and the most rapidly acting of the opiates. Heroin is processed from morphine, a naturally occurring substance extracted from the seed pod of certain varieties of poppy plants. It is typically sold as a white or brownish powder or as the black sticky substance known on the streets as "black tar heroin." Although purer heroin is becoming more common, most street heroin is "cut" with other drugs or with substances such as sugar, starch, powdered milk, or quinine. Street heroin can also be cut with strychnine or other poisons. Because heroin abusers do not know the actual strength of the drug or its true contents, they are at risk of overdose or death. Heroin also poses special problems because of the transmission of HIV and other diseases that can occur from sharing needles or other injection equipment.

What is the scope of heroin use in the United States?

According to the 1998 National Household Survey on Drug Abuse, which may actually underestimate illicit opiate (heroin) use, an estimated 2.4 million people had used heroin at some time in their lives, and nearly 130,000 of them reported using it within the month preceding the survey. The survey report estimates that there were 81,000 new heroin

users in 1997. A large proportion of these recent new users were smoking, snorting, or sniffing heroin, and most (87 percent) were under age 26. In 1992, only 61 percent were younger than 26.

The 1998 Drug Abuse Warning Network (DAWN), which collects data on drug-related hospital emergency department (ED) episodes from 21 metropolitan areas, estimates that 14 percent of all drug-related ED episodes involved heroin. Even more alarming is the fact that between 1991 and 1996, heroin-related ED episodes more than doubled (from 35,898 to 73,846). Among youths aged 12 to 17, heroin-related episodes nearly quadrupled.

NIDA's Community Epidemiology Work Group (CEWG), which provides information about the nature and patterns of drug use in 21 cities, reported in its December 1999 publication that heroin was mentioned most often as the primary drug of abuse in drug abuse treatment admissions in Baltimore, Boston, Los Angeles, Newark, New York, and San Francisco.

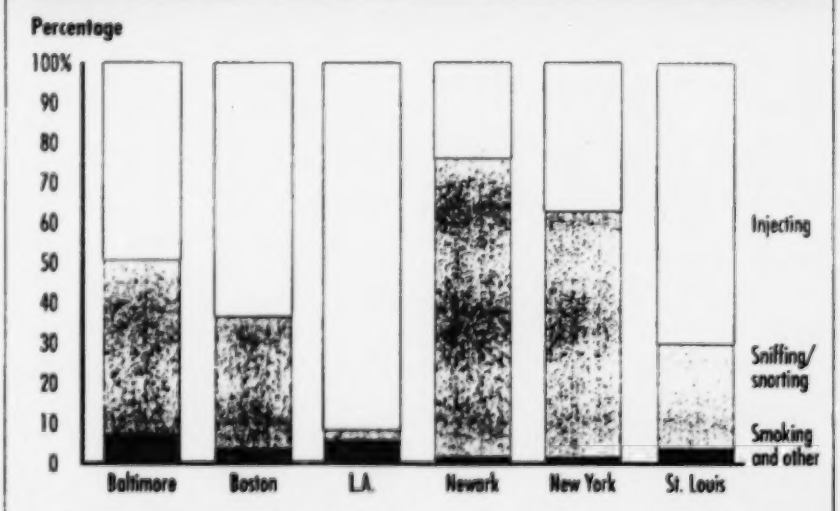
How is heroin used?

Heroin is usually injected, sniffed/snorted, or smoked. Typically, a heroin abuser may inject up to four times a day. Intravenous injection provides the greatest intensity and most rapid onset of euphoria (7 to 8 seconds), while intramuscular injection produces a relatively slow onset of euphoria (5 to 8 minutes). When heroin is sniffed or smoked, peak effects are usually felt within 10 to 15 minutes. Although smoking and sniffing heroin do not produce a "rush" as quickly or as intensely as intravenous injection, NIDA researchers have confirmed that all three forms of heroin administration are addictive.

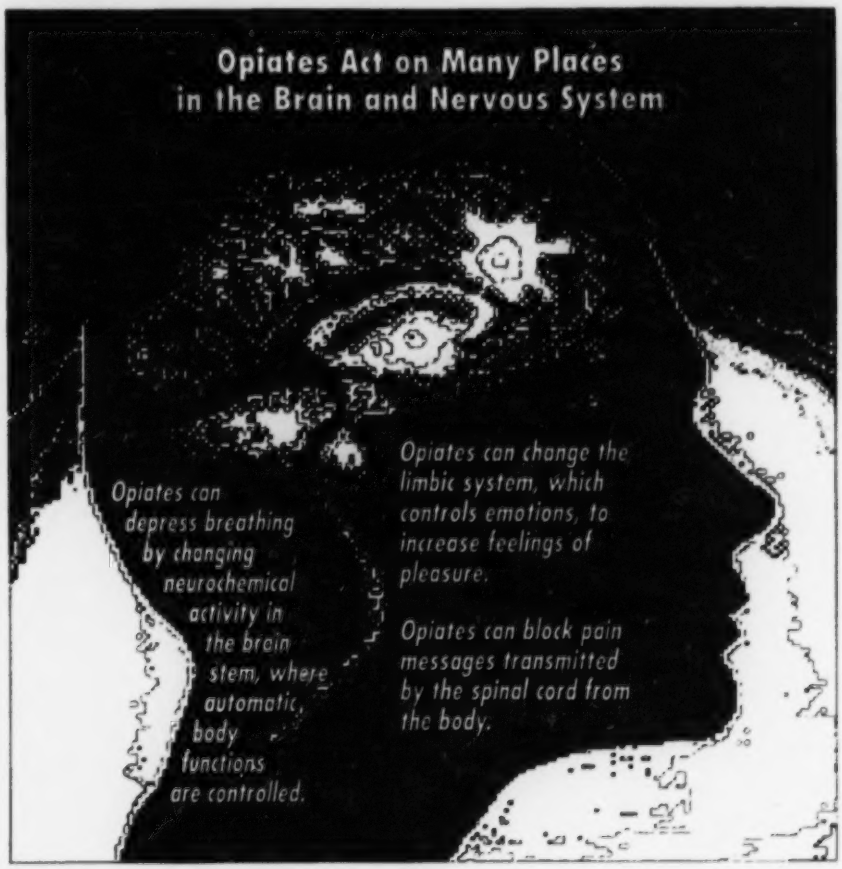
Injection continues to be the predominant method of heroin use among addicted users seeking treatment; however, researchers have observed a shift in heroin use patterns, from injection to sniffing and smoking. In fact, sniffing/snorting heroin is now the most widely reported means of taking heroin among users admitted for drug treatment in Newark, Chicago, and New York.

With the shift in heroin abuse patterns comes an even more diverse group of users. Older users (over 30) continue to be one of the largest user groups in most national data. However, the increase continues in new, young users across the country who are being lured by inexpensive, high-purity heroin that can be sniffed or smoked instead of injected. Heroin has also been appearing in more affluent communities.

Route of Administration Among Heroin Treatment Admissions in Selected Areas



Source: Community Epidemiology Work Group, NIDA, December 1999


Opiates Act on Many Places in the Brain and Nervous System
Opiates can depress breathing by changing neurochemical activity in the brain stem, where automatic body functions are controlled.
Opiates can change the limbic system, which controls emotions, to increase feelings of pleasure.
Opiates can block pain messages transmitted by the spinal cord from the body.

What are the immediate (short-term) effects of heroin use?

Soon after injection (or inhalation), heroin crosses the blood-brain barrier. In the brain, heroin is converted to morphine and binds rapidly to opioid receptors. Abusers typically report feeling a surge of pleasurable sensation, a "rush." The intensity of the rush is a function of how much drug is taken and how rapidly the drug enters the brain and binds to the natural opioid receptors. Heroin is particularly addictive because it enters the brain so rapidly. With heroin, the rush is usually accompanied by a warm flushing of the skin, dry mouth, and a heavy feeling in the extremities, which may be accompanied by nausea, vomiting, and severe itching.

After the initial effects, abusers usually will be drowsy for several hours. Mental function is clouded by heroin's effect on the central nervous system. Cardiac function slows. Breathing is also severely slowed, sometimes to the point of death. Heroin overdose is a particular risk on the street, where the amount and purity of the drug cannot be accurately known.

What are the long-term effects of heroin use?

One of the most detrimental long-term effects of heroin is addiction itself. Addiction is a chronic, relapsing disease, characterized by compulsive drug seeking and use, and by neurochemical and molecular changes in the brain. Heroin also produces profound degrees of tolerance and physical dependence, which are also powerful motivating factors for compulsive use and abuse. As with abusers of any addictive drug, heroin abusers gradually spend more and more time and energy obtaining and using the drug. Once they are addicted, the heroin abusers' primary purpose in life becomes seeking and using drugs. The drugs literally change their brains.

Physical dependence develops with higher doses of the drug. With physical dependence, the body adapts to the presence of the drug and withdrawal symptoms occur if use is reduced abruptly. Withdrawal may occur within a few hours after the last time the drug is taken. Symptoms of withdrawal include restlessness, muscle and bone pain, insomnia, diarrhea, vomiting, cold flashes with goose bumps ("cold turkey"), and leg movements. Major withdrawal symptoms peak between 24 and 48 hours after the last dose of heroin and subside after about a week. However, some people have shown persistent withdrawal signs for many months. Heroin withdrawal is never fatal to otherwise healthy

adults, but it can cause death to the fetus of a pregnant addict.

At some point during continuous heroin use, a person can become addicted to the drug. Sometimes addicted individuals will endure many of the withdrawal symptoms to reduce their tolerance for the drug so that they can again experience the rush.

Physical dependence and the emergence of withdrawal symptoms were once believed to be the key features of heroin addiction. We now know this may not be the case entirely, since craving and relapse can occur weeks and months after withdrawal symptoms are long gone. We also know that patients with chronic pain who need opiates to function (sometimes over extended periods) have few if any problems leaving opiates after their pain is resolved by other means. This may be because the patient in pain is simply seeking relief of pain and not the rush sought by the addict.

What are the medical complications of chronic heroin use?

Medical consequences of chronic heroin abuse include scarred and/or collapsed veins, bacterial infections of the blood vessels and heart valves, abscesses (boils) and other soft-tissue infections, and liver or kidney disease. Lung complications (including various types of pneumonia and tuberculosis) may result from the poor health condition of the abuser as well as from heroin's depressing effects on respiration. Many of the additives in street heroin may include substances that do not readily dissolve and result in clogging the blood vessels that lead to the lungs, liver, kidneys, or brain. This can cause infection or even death of small patches of cells in vital organs. Immune reactions to these or other contaminants can cause arthritis or other rheumatologic problems.

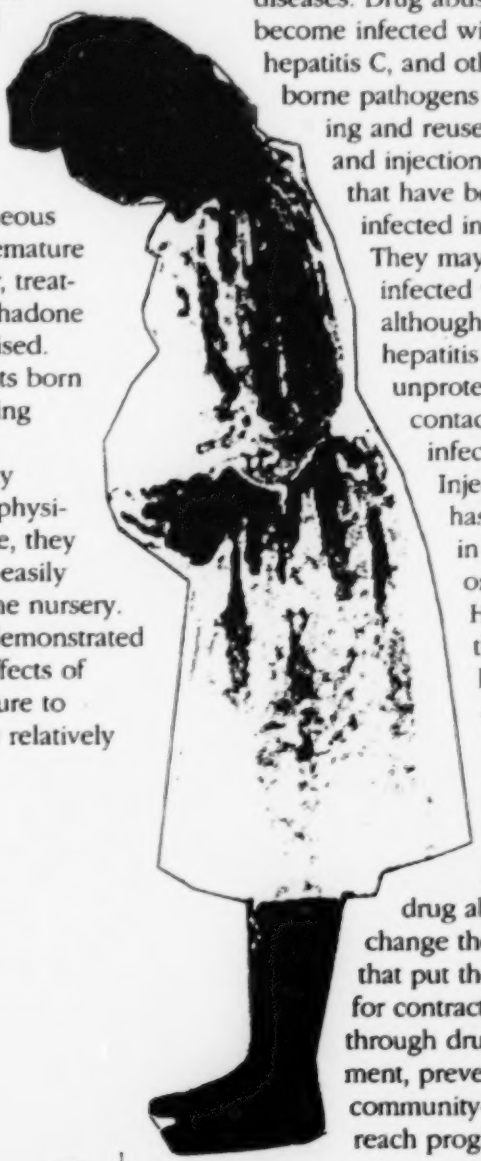
Of course, sharing of injection equipment or fluids can lead to some of the most severe consequences of heroin abuse—infections with hepatitis B and C, HIV, and a host of other blood-borne viruses, which drug abusers can then pass on to their sexual partners and children.

Short- and Long-Term Effects of Heroin Abuse

Short-Term Effects:	***Long-Term Effects:***
"Rush"	*Addiction*
Depressed respiration	*Infectious diseases, for example, HIV/AIDS and hepatitis B and C*
Clouded mental functioning	*Collapsed veins*
Nausea and vomiting	*Bacterial infections*
Suppression of pain	*Abscesses*
Spontaneous abortion	*Infection of heart lining and valves*
	Arthritis and other rheumatologic problems

How does heroin abuse affect pregnant women?

Heroin abuse can cause serious complications during pregnancy, including miscarriage and premature delivery. Children born to addicted mothers are at greater risk of SIDS (sudden infant death syndrome), as well. Pregnant women should not be detoxified from opiates because of the increased risk of spontaneous abortion or premature delivery; rather, treatment with methadone is strongly advised. Although infants born to mothers taking prescribed methadone may show signs of physical dependence, they can be treated easily and safely in the nursery. Research has demonstrated also that the effects of in utero exposure to methadone are relatively benign.



Why are heroin users at special risk for contracting HIV/AIDS and hepatitis C?

Heroin addicts are at risk for contracting HIV, hepatitis C, and other infectious diseases. Drug abusers may become infected with HIV, hepatitis C, and other blood-borne pathogens through sharing and reuse of syringes and injection paraphernalia that have been used by infected individuals. They may also become infected with HIV and, although less often, to hepatitis C through unprotected sexual contact with an infected person. Injection drug use has been a factor in an estimated one-third of all HIV and more than half of all hepatitis C cases in the Nation.

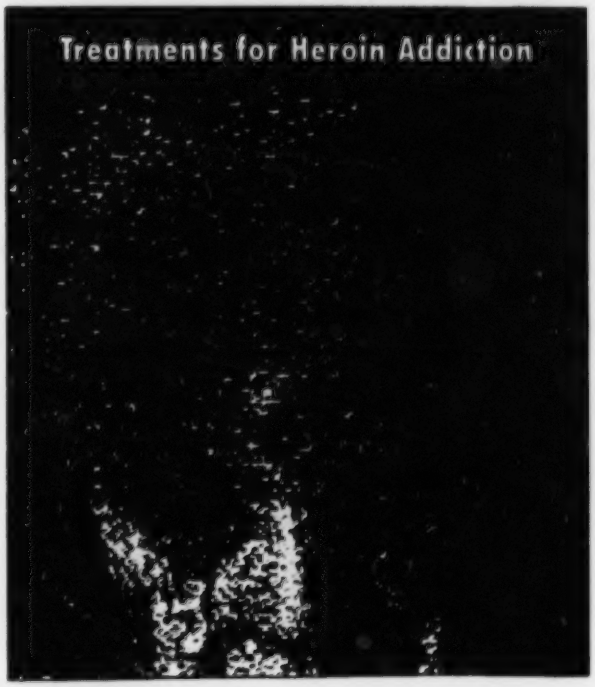
NIDA-funded research has found that drug abusers can change the behaviors that put them at risk for contracting HIV, through drug abuse treatment, prevention, and community-based outreach programs. They can eliminate drug use, drug-related risk behaviors such as needle sharing, unsafe sexual practices, and, in turn, the risk of exposure to HIV/AIDS and other infectious diseases. Drug abuse prevention and treatment are highly effective in preventing the spread of HIV.

What are the treatments for heroin addiction?

A variety of effective treatments are available for heroin addiction. Treatment tends to be more effective when heroin abuse is identified early. The treatments that follow vary depending on the individual, but methadone, a synthetic opiate that blocks the effects of heroin and eliminates withdrawal symptoms, has a proven record of success for people addicted to heroin. Other pharmaceutical approaches, like LAAM (levo-alpha-acetyl-methadol) and buprenorphine, and many behavioral therapies also are used for treating heroin addiction.

Detoxification

The primary objective of detoxification is to relieve withdrawal symptoms while patients adjust to a drug-free state. Not in itself a treatment for addiction, detoxification is a useful step only when it leads into long-term treatment that is either drug-free (residential or outpatient) or uses medications as part of the treatment. The best documented drug-free treatments are the therapeutic community residential programs lasting at least 3 to 6 months.



Methadone programs

LAAM, buprenorphine, and other medications

Behavioral therapies

Methadone programs

Methadone treatment has been used effectively and safely to treat opioid addiction for more than 30 years. Properly prescribed methadone is not intoxicating or sedating, and its effects do not interfere with ordinary activities such as driving a car. The medication is taken orally and it suppresses narcotic withdrawal for 24 to 36 hours. Patients are able to perceive pain and have emotional reactions. Most important, methadone relieves the craving associated with heroin addiction; craving is a major reason for relapse. Among methadone patients, it has been found that normal street doses of heroin are ineffective at producing euphoria, thus making the use of heroin more easily extinguishable.

Methadone's effects last for about 24 hours—four to six times as long as those of heroin—so people in treatment need to take it only once a day. Also, methadone is medically safe even when used continuously for 10 years or more. Combined with behavioral therapies or counseling and other supportive services, methadone enables patients to stop using heroin (and other opiates) and return to more stable and productive lives.

Methadone dosages must be carefully monitored in patients who are receiving antiviral therapy for HIV infection, to avoid potential medication interactions.

LAAM and other medications

LAAM, like methadone, is a synthetic opiate that can be used to treat heroin addiction. LAAM can block the effects of heroin for up to 72 hours with minimal side effects when taken orally. In 1993 the Food and Drug Administration approved the use of LAAM for treating patients addicted to heroin. Its long duration of action permits dosing just three times per week, thereby eliminating the need for daily dosing and take-home doses for weekends. LAAM will be increasingly available in clinics that already dispense methadone.

Naloxone and naltrexone are medications that also block the effects of morphine, heroin, and other opiates. As antagonists, they are especially useful as antidotes. Naltrexone has long-lasting effects, ranging from 1 to 3 days, depending on the dose. Naltrexone blocks the pleasurable effects of heroin and is useful in treating some highly motivated individuals. Naltrexone has also been found to be successful in preventing relapse by former opiate addicts released from prison on probation.

Another medication to treat heroin addiction, buprenorphine, may already be available by the time this Research Report appears. Buprenorphine is a particularly attractive treatment because, compared to other medications, such as methadone, it causes weaker opiate effects and is less likely to cause overdose problems. Buprenorphine also produces a lower level of physical dependence, so patients who discontinue the medication generally have fewer withdrawal symptoms than do those who stop taking

methadone. Because of these advantages, buprenorphine may be appropriate for use in a wider variety of treatment settings than the currently available medications. Several other medications with potential for treating heroin overdose or addiction are currently under investigation by NIDA.

Behavioral therapies

Although behavioral and pharmacologic treatments can be extremely useful when employed alone, science has taught us that integrating both types of treatments will ultimately be the most effective approach. There are many effective behavioral treatments available for heroin addiction. These can include residential and outpatient approaches. An important task is to match the best treatment approach to meet the particular needs of the patient. Moreover, several new behavioral therapies, such as contingency management therapy and cognitive-behavioral interventions, show particular promise as treatments for heroin addiction. Contingency management therapy uses a voucher-based system, where patients earn "points" based on negative drug tests, which they can exchange for items that encourage healthy living. Cognitive-behavioral interventions are designed to help modify the patient's thinking, expectancies, and behaviors and to increase skills in coping with various life stressors. Both behavioral and pharmacological treatments help to restore a degree of normalcy to brain function and behavior, with increased employment rates and lower risk of HIV and other diseases and criminal behavior.

What are the opioid analogs and their dangers?

Drug analogs are chemical compounds that are similar to other drugs in their effects but differ slightly in their chemical structure. Some analogs are produced by pharmaceutical companies for legitimate medical reasons. Other analogs, sometimes referred to as "designer" drugs, can be produced in illegal laboratories and are often more dangerous and potent than the original drug. Two of the most commonly known opioid analogs are fentanyl and meperidine (marketed under the brand name Demerol, for example).

Fentanyl was introduced in 1968 by a Belgian pharmaceutical company as a synthetic narcotic to be used as an analgesic in surgical procedures because of its minimal effects on the heart. Fentanyl is particularly dangerous because it is 50 times more potent than heroin and can rapidly stop respiration. This is not a problem during surgical procedures because machines are used to help patients breathe. On the street, however, users have been found dead with the needle used to inject the drug still in their arms.

NIDA Web Sites
www.drugabuse.gov
www.steroidabuse.org
www.clubdrugs.org

Where can I get further scientific information about heroin abuse and addiction?

To learn more about heroin and other drugs of abuse, contact the National Clearinghouse for Alcohol and Drug Information (NCADI) at 1-800-729-6686. Information specialists are available to assist you in locating needed information and resources. Information can be accessed also through the NIDA World Wide Web site (www.drugabuse.gov) or the NCADI Web site (www.health.org).

Access information on the Internet

- **What's new on the NIDA Web site**
- **Information on drugs of abuse**
- **Publications and communications (including *NIDA NOTES*)**
- **Calendar of events**
- **Links to NIDA organizational units**
- **Funding information (including program announcements and deadlines)**
- **International activities**
- **Links to related Web sites (access to Web sites of many other organizations in the field)**

NCADI
Web Site: www.health.org
Phone No.: 1-800-729-6686

Glossary

Addiction: A chronic, relapsing disease, characterized by compulsive drug seeking and use and by neurochemical and molecular changes in the brain.

Agonist: A chemical compound that mimics the action of a natural neurotransmitter.

Analog: A chemical compound that is similar to another drug in its effects but differs slightly in its chemical structure.

Antagonist: A drug that counteracts or blocks the effects of another drug.

Buprenorphine: A mixed opiate agonist-antagonist medication for the treatment of heroin addiction.

Craving: A powerful, often uncontrollable desire.

Detoxification: A process of allowing the body to rid itself of a drug while managing the symptoms of withdrawal; often the first step in a drug treatment program.

Fentanyl: A medically useful opioid analog that is 50 times more potent than heroin.

Levo-alpha-acetyl-methadol (LAAM): An FDA-approved medication for heroin addiction that patients need to take only three to four times a week.

Meperidine: A medically approved opioid available under various brand names (e.g., Demerol).

Methadone: A long-acting synthetic medication shown to be effective in treating heroin addiction.

Physical dependence: An adaptive physiological state that occurs with regular drug use and results in a withdrawal syndrome when drug use is stopped; usually occurs with tolerance.

Rush: A surge of euphoric pleasure that rapidly follows administration of a drug.

Tolerance: A condition in which higher doses of a drug are required to produce the same effect as during initial use; often leads to physical dependence.

Withdrawal: A variety of symptoms that occur after use of an addictive drug is reduced or stopped.

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